

What is claimed is:

1. A switching regulator for supplying an electrical load with a constant voltage which comprises:

switching means inserted into a current route between
5 an external voltage source and said electric load;

smoothing means for smoothing an output from said switching means;

control signal generating means for generating a PWM signal for switching said switching means, in such a
10 manner that an output from said smoothing means are kept constant;

rush current preventing means, in order to prevent a rush current from flowing in said current route, for generating a suppress control signal for suppressing a duty
15 of said PWM signal within a prescribed duty during a prescribed time period, if a prescribed point voltage at a prescribed point on said current route after said switching regulator was turned on ascends and crosses over a prescribed ascending reference which is fixed lower than
20 said prescribed point voltage; and

recovering means for operating again said rush current preventing means even after once completing its operation, if said prescribed point voltage descends and crosses down a prescribed descending reference which is
25 fixed lower than said prescribed ascending reference.

2. The switching regulator according to claim 1, wherein:

said control signal generating means includes:

reference voltage generating means for generating a prescribed reference voltage if said prescribed point voltage is higher than said ascending reference; and comparison signal generating means for generating a comparison
5 signal of which amplitude is proportional to a difference between said prescribed reference voltage and a fraction of a smoothed voltage outputted from said smoothing means, wherein said control signal generating means generates said PWM signal of which duty is determined by a signal
10 level of said comparison signal; and

said rush current preventing means suppresses a duty of said PWM signal by allowing said comparison signal generating means to generate said comparison signal of which signal level is changed in such a manner that said
15 duty increases with the lapse of time.

3. The switching regulator according to claim 2, wherein:

said rush current preventing means is a condenser which is charged from a discharged voltage up to said
20 prescribed reference voltage during said prescribed time period and which supplies, in place of said prescribed reference voltage, said comparison signal generating means with a voltage of said condenser during being charged; and

25 said recovering means operates again said rush current preventing means by discharging said condenser.

4. The switching regulator according to claim 1, wherein said rush current preventing means comprises:

pulse generating means for generating a pulse train during said prescribed time period; and suppress control signal generating means for generating said suppress control signal on the basis of said pulse train; and

5 said recovering means operates again said rush current preventing means by resetting said pulse generating means.

5. The switching regulator according to claim 4, wherein:

10 said suppress control signal generating means includes off-driving means for changing a signal level of said PWM signal into a level which turns off said switching means; and

15 said suppress control signal generating means generates, on the basis of an operation of said off-driving means, said suppress control signal in which a component of a level which turns on said switching means is suppressed.

20 6. The switching regulator according to claim 1, wherein said recovering means detects said prescribed point voltage through a low pass filter connected with said external voltage source.

25 7. The switching regulator according to claim 1, wherein said prescribed point voltage is a voltage outputted from said external voltage source.

8. The switching regulator according to claim 1, wherein said prescribed point voltage is a voltage outputted from said smoothing means.

9. The switching regulator according to claim 1,
which further comprises other regulator connected between
said smoothing means and electric load,

5 wherein said prescribed point voltage is a voltage
outputted from said other regulator.

10. The switching regulator according to claim 1,
which further comprises first determining means for
determining said prescribed time period, second
determining means for determining said ascending
10 reference and third determining means for determining
said descending reference,

wherein a one-chip semiconductor circuit includes all
means except said first to third means and switching
means.

15 11. A power source for supplying an electrical load
with a constant voltage which comprises:

a switching regulator comprising,

switching means inserted into a current route
between an external voltage source and said electric load,

20 smoothing means for smoothing an output from
said switching means,

control signal generating means for generating a
PWM signal for switching said switching means, in such a
manner that an output from said smoothing means are
25 kept constant,

rush current preventing means for preventing a
rush current on said current route by suppressing a duty of
said PWM signal within a prescribed duty during a

prescribed time period, if a prescribed point voltage at a prescribed point on said current route after said voltage source is turned on ascends and crosses over a prescribed ascending reference,

5 recovering means for operating again said rush current preventing means even after once completing its operation, if said prescribed point voltage descends and crosses down a prescribed descending reference which is fixed lower than said prescribed ascending reference; and

10 one or more secondary regulators connected between said smoothing means and electric load for regulating an output from said smoothing means.

12. The power source according to claim 11, wherein said descending reference is fixed higher than a lowest
15 voltage at which either of said switching regulator, or said secondary regulators is tuned off.

13. The power source according to claim 11, wherein said power source is mounted on a vehicle.